

WE CLAIM:

1. A method for measuring the temperature of a
5 semiconductor wafer, comprising:

placing a coil adjacent a semiconductor wafer;

flowing an AC current through said coil to create an
10 electromagnetic field in said semiconductor wafer;

heating said semiconductor wafer;

monitoring an inductance of said coil; and

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determining said semiconductor wafer temperature from
said inductance of said coil.

2. The method of claim 1 wherein said semiconductor wafer
20 is placed in a semiconductor processing tool.

3. The method of claim 2 further comprising placing a first
semiconductor in thermal contact with said semiconductor
wafer and adjacent to said coil.

4. The method of claim 3 wherein said first semiconductor is a material from a group consisting of Silicon, Germanium (Ge), Gallium Phosphide (GaP), Gallium Arsenide (GaAs),
5 Gallium Antimonide (GaSb), Gallium Nitride (GaN), Indium Phosphide (InP), Indium Arsenide (InAs), Indium Antimonide (InSb), Aluminum Arsenide (AlAs), Aluminum Nitride (AlN), Aluminum Phosphide (AlP), Aluminum Antimonide (AlSb), AlGaAs, InGaAsP, GaAsP, AlGaN, Zinc Selenide (ZnSe), Zinc
10 Telluride (ZnTe), Cadmium Telluride (CdTe), Zinc Sulphide (ZnS), Mercury Telluride (HgTe) and Mercury Cadmium Telluride (HgCdTe).

5. A dual coil method for measuring semiconductor wafer temperature, comprising:

placing a first coil adjacent a semiconductor wafer;

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placing a second coil adjacent said first coil and said semiconductor wafer;

flowing an AC current through said first coil to
10 create an electromagnetic field in said semiconductor wafer;

heating said semiconductor wafer;

15 monitoring an electromotive force (emf) induced in said second coil; and

determining said semiconductor wafer temperature from said emf induced in said second coil.

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6. The method of claim 5 wherein said semiconductor wafer is placed in a semiconductor processing tool.

7. The method of claim 6 further comprising placing a first semiconductor in thermal contact with said semiconductor wafer and adjacent to said first coil and said second coil.

5 8. The method of claim 7 wherein said first semiconductor is a material from a group consisting of Silicon, Germanium (Ge), Gallium Phosphide (GaP), Gallium Arsenide (GaAs), Gallium Antimonide (GaSb), Gallium Nitride (GaN), Indium Phosphide (InP), Indium Arsenide (InAs), Indium Antimonide
10 (InSb), Aluminum Arsenide (AlAs), Aluminum Nitride (AlN), Aluminum Phosphide (AlP), Aluminum Antimonide (AlSb), AlGaAs, InGaAsP, GaAsP, AlGaN, Zinc Selenide (ZnSe), Zinc Telluride (ZnTe), Cadmium Telluride (CdTe), Zinc Sulphide (ZnS), Mercury Telluride (HgTe) and Mercury Cadmium
15 Telluride (HgCdTe).

9. A temperature probe apparatus, comprising:

a first coil in an enclosure;

5 a second coil in said enclosure adjacent to said first coil; and

a first material in said enclosure adjacent to said first coil and said second coil, wherein said first
10 material possesses a temperature dependent conductivity.

10. The temperature probe apparatus of claim 9 wherein said first material is a semiconductor.

15 11. The temperature probe apparatus of claim 10 wherein said semiconductor is a material from a group consisting of Silicon, Germanium (Ge), Gallium Phosphide (GaP), Gallium Arsenide (GaAs), Gallium Antimonide (GaSb), Gallium Nitride (GaN), Indium Phosphide (InP), Indium Arsenide (InAs),
20 Indium Antimonide (InSb), Aluminum Arsenide (AlAs), Aluminum Nitride (AlN), Aluminum Phosphide (AlP), Aluminum Antimonide (AlSb), AlGaAs, InGaAsP, GaAsP, AlGaN, Zinc Selenide (ZnSe), Zinc Telluride (ZnTe), Cadmium Telluride

(CdTe), Zinc Sulphide (ZnS), Mercury Telluride (HgTe) and Mercury Cadmium Telluride (HgCdTe).

12. The temperature probe apparatus of claim 9 further
5 comprising an AC excitation source connected to said first coil and an apparatus for measuring induced electromotive force connected to said second coil.

13. A method for temperature measurement, comprising:

placing a first coil in an enclosure;

5 placing a second coil in said enclosure adjacent to
said first coil;

placing a first material in said enclosure adjacent to
said first coil and said second coil, wherein said first
10 material possesses a temperature dependent conductivity;

placing said first material against a piece whose
temperature is to be measured;

15 flowing an AC current through said first coil to
produce an electromagnetic field in said first material;

measuring an electromotive force (emf) induced in said
second coil; and

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determining a temperature of said piece.

14. The method of claim 13 wherein said first material is a
semiconductor.

15. The method of claim 14 wherein said semiconductor is a material from a group consisting of Silicon, Germanium (Ge), Gallium Phosphide (GaP), Gallium Arsenide (GaAs),
5 Gallium Antimonide (GaSb), Gallium Nitride (GaN), Indium Phosphide (InP), Indium Arsenide (InAs), Indium Antimonide (InSb), Aluminum Arsenide (AlAs), Aluminum Nitride (AlN), Aluminum Phosphide (AlP), Aluminum Antimonide (AlSb), AlGaAs, InGaAsP, GaAsP, AlGaN, Zinc Selenide (ZnSe), Zinc
10 Telluride (ZnTe), Cadmium Telluride (CdTe), Zinc Sulphide (ZnS), Mercury Telluride (HgTe) and Mercury Cadmium Telluride (HgCdTe).

16. The method of claim 13 further comprising monitoring
15 the inductance of said first coil and determining said temperature of said piece from said monitored inductance.

17. An apparatus for measuring the temperature of a semiconductor wafer, comprising:

A semiconductor processing tool;

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a mount to hold a semiconductor wafer positioned in said semiconductor processing tool;

a first coil positioned in said semiconductor tool to
10 be adjacent to said semiconductor wafer;

electronic apparatus connected to said coil to provide an AC current excitation to said coil and to monitor a inductance of said coil.

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18. The apparatus of claim 17 further comprising:

a second coil positioned adjacent to said first coil;
and

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electronic apparatus connected to said second coil for measuring an electromotive force in said second coil.

19. The apparatus of claim 17 further comprising placing a first semiconductor in thermal contact with said semiconductor wafer and adjacent to said first coil.

5 20. The apparatus of claim 18 further comprising placing a first semiconductor in thermal contact with said semiconductor wafer and adjacent to said first coil and said second coil.

10 21. The method of claim 20 wherein said first semiconductor is a material from a group consisting of Silicon, Germanium (Ge), Gallium Phosphide (GaP), Gallium Arsenide (GaAs), Gallium Antimonide (GaSb), Gallium Nitride (GaN), Indium Phosphide (InP), Indium Arsenide (InAs), Indium Antimonide
15 (InSb), Aluminum Arsenide (AlAs), Aluminum Nitride (AlN), Aluminum Phosphide (AlP), Aluminum Antimonide (AlSb), AlGaAs, InGaAsP, GaAsP, AlGaN, Zinc Selenide (ZnSe), Zinc Telluride (ZnTe), Cadmium Telluride (CdTe), Zinc Sulphide (ZnS), Mercury Telluride (HgTe) and Mercury Cadmium
20 Telluride (HgCdTe).

22. The method of claim 19 wherein said first semiconductor is a material from a group consisting of Silicon, Germanium (Ge), Gallium Phosphide (GaP), Gallium Arsenide (GaAs),

Gallium Antimonide (GaSb), Gallium Nitride (GaN), Indium Phosphide (InP), Indium Arsenide (InAs), Indium Antimonide (InSb), Aluminum Arsenide (AlAs), Aluminum Nitride (AlN), Aluminum Phosphide (AlP), Aluminum Antimonide (AlSb),
5 AlGaAs, InGaAsP, GaAsP, AlGaN, Zinc Selenide (ZnSe), Zinc Telluride (ZnTe), Cadmium Telluride (CdTe), Zinc Sulphide (ZnS), Mercury Telluride (HgTe) and Mercury Cadmium Telluride (HgCdTe).